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EXAMINER

THAI, LUAN C

ART UNIT	PAPER NUMBER
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2827

DATE MAILED: 05/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary**Application No.**

10/055,298

Applicant(s)

AKRAM ET AL.

Examiner

Luan Thai

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133)
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 February 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-136 is/are pending in the application.
- 4a) Of the above claim(s) See Continuation Sheet is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 14-34, 40-43, 49-56, 62-82, 88-91, 97-104 and 110-116 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2&5. 6) ☐ Other: _____

Continuation of Disposition of Claims: Claims withdrawn from consideration are 9-13,35-39,44-48,57-61,83-87,92-96,105-109 and 117-136.

DETAILED ACTION

Election/Restrictions

1. Applicant's election *without traverse* of Embodiment I (illustrated in Figure 3), claims 1-8, 13-43, 49-56, 62-82, 88-91, 97-104, and 110-116, in Paper No. 9 is acknowledged. However, the limitation of "a diamond film formed between the passivation layer and the substrate, and directly contacting the surface of the substrate" recited in claims 13 and 39, and the limitation of "a second layer including diamond located between the substrate and the layer" recited in claims 35-38, are not seen in the elected embodiment of figure 3, but in the non-elected embodiment of figure 6. Thus, not only claims 9-12, 44-48, 57-60, 83-87, 92-96, 105-109, but also claims 13, 39, and 35-38, are withdrawn from consideration as being directed to non-elected embodiments. Claims 1, 27, 40, 49, 75, 88, and 97 are generic.

Priority

2. This application appears to be a division of Application No. 09/885,615, filed 06/20/01, Pat. No. 6,541,303.

Information Disclosure Statement

3. The information disclosure statements (IDS) filed on 1/23/02 and 06/16/02 have been considered by the examiner.

Oath/Declaration

4. The declaration filed 1/23/02 is acceptable.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1-5, 19-26, 27-31, 40-43, 49-53, 67-79, 88-91, 97-101, and 115-116 are rejected under 35 U.S.C. 102(b) as being anticipated by Sahara et al (4,764,804).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 1-5, 19-26, 27-31, 40-43, 49-53, 67-79, 88-91, 97-101, and 115-116, Sahara et al (see specifically figures 2 and 6 attached, and Col. 3, line 7 to Col. 8, line 68)) disclose a semiconductor device assembly comprising: a semiconductor substrate (or die or wafer or carrier) 1 having an active surface, a passivation layer 6 formed on the active surface of the substrate, a circuit trace 7 having at least a portion thereof located on a portion of the passivation layer 6, a layer 11 comprising substantially diamond (Col. 3, lines 32+) provided over at least a portion of the passivation layer 6 having at least one aperture 11' (or opening) therein, and having at least one contact pad (or bond pad) 10 located on the active surface of the substrate, the contact pad 10 having at least a

periphery portion 10' extending at least partially over and contacting the diamond layer 11 adjacent the aperture 11' and having a portion 10" extending at least through a portion of the aperture 11' in the diamond layer 11, wherein the contact pad 10 is connected to the circuit trace 7 on the semiconductor substrate 1; and a carrier substrate 3 having the semiconductor substrate 1 attached thereto via adhesive bump 9. Sahara et al further disclose a conductive bump 8 deposited on the contact pad 10.

Since the layer comprising substantially diamond 11 formed on the semiconductor substrate 1 has excellent thermal conductivity to improve heat-dissipating characteristics of the semiconductor device (see abstract and Col. 5, lines 1+), the layer comprising substantially diamond 11 is considered as the claimed "heat sink disposed on a semiconductor device".

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 7-8, 14-18, 33-34, 55-56, 62-66, 81-82, 103-104 and 110-114 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sahara et al (4,764,804) in view of Garg et al (5,126,206).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 7, 14-18, 33, 55, 62-66, 81, 103 and 110-114, Sahara et al disclose all the limitations of the claimed invention as detailed above except for a) the specific material of the layer comprising substantially diamond 11 (e.g., comprising substantially polycrystalline diamond, substantially amorphous diamond, another material, or the combination thereof (as recited in claims 15-18, 62-66, and 110-114), and b) the thickness of the layer comprising substantially diamond 11 to be at least 50 angstroms (as recited in claims 7, 33, 55, 81, and 103).

A layer, which comprises substantially polycrystalline diamond, substantially amorphous diamond, another material, or the combination thereof, and has a thickness at least 50 angstroms, however, is commonly used in semiconductor art as a coated layer for a semiconductor substrate, as disclosed by Garg et al (Col. 11, lines 38+, Col. 8, lines 39+, Col. 17, lines 24+). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the layer comprising substantially diamond, as taught by Garg et al, to the device assembly of Sahara et al, since such layer is commonly used in semiconductor art.

Regarding claims 8, 34, 56, 82, and 104, the proposed device of Sahara et al and Garg et al discloses all the limitations of the claimed invention as detailed above except for the thickness of the layer comprising substantially diamond being between about 50 and 2000 angstroms (the proposed device of Sahara et al and Garg et al does disclose the thickness of that layer to be about

0.5 μm (5,000 angstroms)). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form the layer comprising substantially diamond in the range 50 angstroms to 2000 angstroms as claimed because the thickness of a layer is an art recognized variable of importance which is subject to routine experimentation and optimization.

9. Claims 6, 32, 54, 80, and 102 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sahara et al (4,764,804) in view of Rinne et al (6,389,691).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 6, 32, 54, 80, and 102, Sahara et al disclose all the limitations of the claimed invention as detailed above except for the material (e.g., polyimide) making the passivation layer.

Polyimide (including silicon nitride and silicon oxide), however, are known materials in semiconductor art for forming a passivation layer, as taught by Rinne et al (see Col. 6, lines 6+). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the well known polyimide material to form the passivation layer in Sahara et al.'s device, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan Thai whose telephone number is (703) 308-1211. The examiner can normally be reached on 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Luan Thai
May 1, 2003

John B. Vigushin
John B. Vigushin
EXAMINER
GDU 2827